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ENERGY AND GROWTH

Montana as a Microcosm

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Submitted by the State of Montana
Thomas L. Judge, Governor

International Conference on Human Environment in Northern Regions
Sapporo, Hokkaido, Japan
September 17-19, 1974

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ABSTRACT

Last winter's energy crisis was an acute symptom of a chronic disease, "America's apparently unsatiable appetite for energy and resources, and its wasteful use of them." (7) Similarly the latter malady is but a part of a worldwide affliction.

> ...caused by the accelerating growth of population, technological development, and consumption that even now places unprecedented pressure on the earth's natural resources, environmental systems and human cultures. (5)

This paper discusses the development pressures that face Montana, especially through the utilization of our large coal reserve. Because of mounting external pressures to develop a state with abundant natural resources, a low population density, a high quality natural environment, and an enviable life style, many Montanans fear they may be able to neither preserve that which they value nor determine their own destiny.

Although discussion herein is focused on the State of Montana, and our efforts to find solutions, our situation is not unique. Montana is a microcosm of the world, in that exponential growth lies at the root of our problems and threatens our eventual collapse. The most profound challenge before global society is to break out of the growth syndrome before we approach or exceed ultimate limits through human numbers, resource exhaustion and/or environmental alteration. We must forsake conventional wisdom and policy-making, and, with international cooperation, establish new, comprehensive policies to cope with the "dynamics and total ecosystems of the earth." (5)

ENERGY AND GROWTH

Montana as a Microcosm

I. OIL EMBARGO

A. International Response

In October of 1973, ten nations made it clear that oil has a role in warfare greater than powering tanks and aircraft. With an immediate 5% cutback in production and the threat of an equal monthly decrease until Israel withdrew from occupied lands and the rights of Palestinian refugees were restored, Arab oil became a potent strategic weapon.

By November, both Britain and Japan had proclaimed national emergencies. Throughout the Western world, "Factories shut down, workers were laid off, lights dimmed, buildings chilled, gasoline stations closed, Sunday driving was banned, fuel prices soared, stock markets fell, and shortages threatened in a host of products, from perfume to fertilizer." (17)

By January, the twelve members of the Organization of Petroleum Exporting Countries (OPEC) had increased the price of oil almost four times (370%) over its 1973 level. (21) Even if prices stabilized, energy costs to Western Europe would leap from $11 billion in 1972 to $50 billion in 1974; to Japan, from $3.6 billion to $17 billion; and to the United States, from $4.5 billion to over $20 billion. (42) Oil Consultant Walter J. Levy noted, "It's no longer a question of supply availability, but a financial problem; it's not too much to say it's a problem of bankruptcy" (42); Secretary of State Henry Kissinger gravely warned of a possible worldwide depression.

B. American Response

Because the United States was less dependent on oil imports, their curtailment was more a discomfort than a disruption. Citizens were asked to turn down thermostats by six degrees, to reduce driving, and to accept less convenient airline flights. Outdoor Christmas lighting was discouraged, highway speed

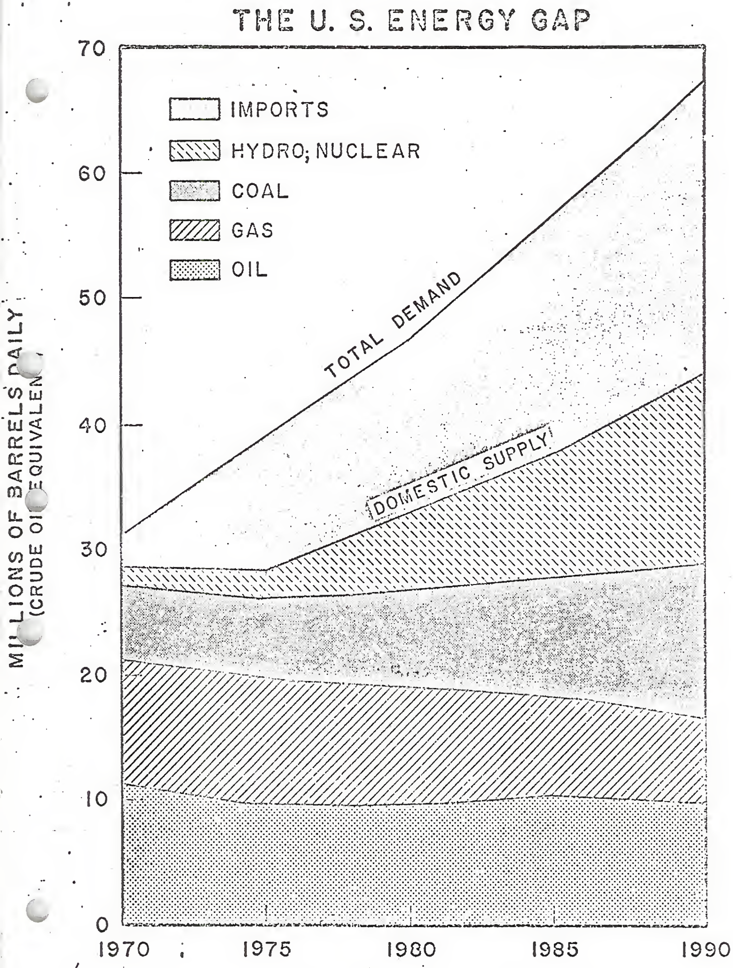
limits were decreased, and gasoline production was cut by 15%. A mandatory allocation program was introduced for home heating oil, kerosene, jet fuel, and diesel fuel. And ex-President Nixon announced that "By the end of this decade, we will have developed the potential to meet our energy needs without depending on any foreign sources." (40)

II. PROJECT INDEPENDENCE

This pronouncement of a goal, which became known as Project Independence, was initially greeted with acclaim, for it appeared a solution to our balance of trade problems and an end of our vulnerability to political blackmail. Even more, it represented a return to pride and patriotism for a nation humiliated by Watergate and agonized by Vietnam, a dramatic achievement overtly compared to Project Apollo.

However, it would be far from easy. Recent industry calculations, as shown in Figure A, had projected a need to import the equivalent of over 20 million barrels per day in 1980. To be, instead, free from imports would require almost incomprehensible increases in domestic production.

Figure A



SOURCE: Shell Oil, The National Energy Outlook, March 1973

Nonetheless, ambitious targets, like the following, have been introduced.

TABLE 1.

ANNUAL TARGETS FOR PRODUCTION AND CONSUMPTION (67)
(All Figures in Millions of Barrels per Day of Oil Equivalent)

	1977	1978	1979	1980	1985
Oil	12.0	12.5	13.0	14.0	15.3
Shale	----	.1	.3	.5	1.5
Natural Gas	11.8	12.0	12.8	13.3	15.0
Coal	9.0	9.6	10.3	11.0	12.1
Hydro	1.4	1.5	1.5	1.5	1.6
Nuclear	.6	.8	.9	1.3	2.6
Geothermal	----	.1	.3	.6	1.0
Total Supply	34.8	36.6	39.1	42.1	49.6
Demand @ 2% Annual Growth	39.6	40.4	41.2	42.1	46.5
NET Imports Needed	4.8	3.8	2.1	0.0	-3.1

Under this plan, not only would the United States be energy self-sufficient in 1980, but it would be exporting the equivalent of 3.1 million barrels per day by 1985. (It should be noted that growth in demand at the annual rate of 2% is assumed, when in fact demand has been increasing at about 4.2%). (38)

Both the physical possibility and the desirability of achieving self-sufficiency by 1980 have been questioned by many scientists, engineers, energy industry representatives, environmental groups, and academic institutions. Numerous administration officials, too, have suggested that dates later than 1980 would be more realistic, and "self-sufficiency" has been redefined to imply a reduction rather than an elimination of imports, a reliance on comparatively "secure" foreign sources like Canada and Venezuela, and a strict limitation on the amount imported from any one nation.

A. Physical Questions

1. Resource Base Limitations

One severe limitation to obtaining energy self-sufficiency by 1980 is the nation's resource base of petroleum and natural gas, which must be relied on to

a great extent to meet production targets. However, domestic reserves of both are diminishing, resulting in widespread projections that the United States, which now imports 40% of our energy, will inevitably become more, rather than less, dependent. (11)

Domestic oil production peaked in 1970 and has since been declining. In fact, indications are that a vigorous program of exploration and development is needed merely to sustain present production, but prospects for finding additional quantities of domestic oil are grim. Major oil companies have provided estimates of undiscovered reserves much lower than those of the U.S. Geological Survey. (15)

In 1968 for the first time, and in each subsequent year, the U.S. has consumed more natural gas than was found in new reserves. (6) Proven reserves as of December 31, 1973, total 247 trillion cubic feet, or about an 11-year supply based on the present annual consumption rate of about 23 trillion cubic feet. (72) A goal of Project Independence is to increase present production by some 4 trillion cubic feet, to a level of 27 trillion cubic feet by the year 1980, and to add another 4 trillion by 1985 to reach a level of 31 trillion cubic feet. (72)

The situation in which we find ourselves is aptly illustrated by a statement in the April 1974 issue of Engineering and Mining Journal:

> The basic question is whether the liquid hydrocarbon sector of the U.S. energy resource bank is capable of sustaining (not expanding) its role in the U.S. economy.

This statement applies equally well to natural gas.

On the western slope of the Rocky Mountains, and concentrated in the State of Colorado, oil shale exists in tremendous quantities, an estimated one trillion barrels (56). However, its production is limited by expensive technology, environmental concerns, and the availability of another key resource, water, much of which "...has reportedly been cornered for surface coal mining". (31)

Coal is the nation's most abundant fuel, and reserves appear to be adequate at least through the end of this century. Although reserves do not restrict Project Independence's goal to expand production from 600 to 960 million tons per year (72), other limiting factors, to be later discussed, certainly do.

2. Technology

Additional limitations are imposed by uncertain, new technologies. Nuclear energy will be expanded radically, but results from the breeder reactor are not expected before 1985 to 1990, at the earliest, and the fusion process can't be perfected before the end of the century. Furthermore, the safety aspects of nuclear energy are not resolved. Most oil shale technologies are in their infancy and will probably not produce over a few hundred thousand barrels per day by 1983. (60) Geothermal energy will contribute, at best, 1% by 1985, and the Joint Committee on Atomic Energy predicts that we'll obtain only about 6% of our energy from the sun by the year 2000. (73)

Coal is advocated as the short-term solution, and the Lurgi and Koppers Totzeh gasification processes and Fischer-Tropsch synthesis liquefaction process are supposedly commercially proven-but not at the commercial size needed. According to Office of Coal Research Director, S. William Gouse, Jr., second generation gasification plants might be in operation by 1982 or 1983. (44)

3. Lead Time

Vastly increasing output, even through utilization of current technologies, is also complicated by the lead times required before new production can begin. For instance, development of a new oil field will take from three to ten years. Between 18 and 24 months elapse before new strip mines produce, and a major underground mine averages 3 to 4 years. With siting and licensing requirements, establishing a new nuclear plant involves a minimum of 7½ years. (47)

4. Materials Shortages

As an example of the magnitude of the facilities required, energy self-

sufficiency would necessitate 100 new strip mines, 140 deep mines, hundreds of off-shore oil rigs, 60 new refineries, and 2 to 3 new nuclear plants each month. 8,000 new locomotives would be needed, along with 150,000 to 200,000 new hopper cars requiring about 8 million tons of steel. (1, 44 and 56) Already strained in many critical areas, like steel, copper, roof bolts and explosives, development of this magnitude will certainly be limited by availability of both raw materials and manufactured products.

5. Manpower

Still another obstacle is posed by the lack of trained or qualified personnel. For example, to achieve energy independence would require 30,000 new engineers-a field which has undergone decreasing college enrollments in the past four years. 190,000 new industrial construction workers would also be needed, as would 240,000 more equipment operators and 125,000 additional coal miners. (1) A nationwide training program might be necessary, but such a program would necessitate substantial expenditures, as well as shifts in labor force distributions and relocations of workers and their families to often remote sites.

B. Financial Questions

1. Government Spending

From every indication, attempting to achieve energy self-sufficiency would necessitate massive federal expenditures, particularly to provide subsidies, price guarantees or other forms of insurance for synthetic fuels production. Without such backing, industry would be unable to borrow the capital required, for the methods to be utilized are essentially unproved. Secretary of Commerce Dent has suggested a total federal cost of up to $98.1 billion. (9) The figure could well be lesser or greater, but in any case either taxes will be raised or taxpayer funds will no longer be available for other federal programs.

2. Private Investment

The National Academy of Engineers estimates that $600 billion in direct costs would be needed for energy production equipment, which does not include financing charges and subsidiary activities. (1) Robert C. Holland, Federal Reserve Board member, set the figure for the energy industries' total capital outlay from 1971 to 1985 at $700 billion, which would equal 30% of all business capital spending in the nation. (20) Such gigantic expenditures would obviously result in increased competition among prospective borrowers of all kinds and upward pressures on interest rates. As Holland noted, the need for funds "...will probably test the flexibility and responsiveness of our financial system as it has seldom been tested before." (20)

3. Income Transfers

In order to encourage domestic supplies, price controls will probably be relaxed or eliminated, contributing further inflationary pressures and additional burdens on consumers. According to an analysis in Technology Review, "The amounts of money involved are large enough to raise real problems of social equity. For example, a $5.00 price increase on 10 million barrels per day of domestic oil and gas amounts to an income transfer [from consumer to company] of $18 billion per year." (45)

C. Social Questions

The physical and financial obstacles clouding the viability of energy self-sufficiency by 1980 are equaled in severity by social questions.

(1) Project Independence has been presented as a virtually finalized goal, but only by the executive branch of the federal government. Because its implications prevade all aspects of American society, such an endeavor should be submitted for approval to a much larger base-the legislative branch (Congress), state governments, local governments, and the general public-before it becomes national policy.

(2) The separation of powers of state and federal governments should be maintained. State standards in such jurisdictions as strip mining reclamation, plant siting and permits, and air quality should not be overridden by the imposition of less stringent regulations.

(3) A recent Environmental Impact Statement on the leasing of federally-held coal contains the following statement:

> Action programs adequate to meet critical energy needs must proceed further and faster than many would like, and certainly far in advance of our ability to completely analyze all of the complex cause and effect relationships that are involved. (63)

Questions can be raised as to the wisdom of acting before an understanding of the consequences of that action can be gained. In addition, the opinion of an informed public cannot be considered in decisions, as mandated in the National Environmental Protection Act, if the public has not been informed of both the benefits and the detriments.

D. Environmental Questions

In the past, the nation has relied on comparatively cheap and easily obtained energy resources, but readily accessible oil reserves no longer exist. Neither do we have great quantities of natural gas, and our hydroelectric potential has been largely developed. Therefore, to meet the goal of energy self-sufficiency by 1980, heavy reliance must be placed on undertaking environmentally risky actions.

EXPLORATION

Assessment drilling for oil in the Outer Continental Shelf and the Gulf of Alaska would begin next year, probably with full scale, operation drilling soon to follow. A five-year relaxation of secondary sulfur emission standards is being asked. Speeding up the construction of 100 nuclear reactors is another feature, as is the construction of oil and gas pipelines from in Alaska. (72) Vast new areas of the nation, primarily in the West, will be subjected to large scale strip mining, and huge plants will be constructed to burn coal or convert it to synthetic gas and oil. A crash program to utilize western oil shale is also urged, despite

the difficult questions associated with such development.

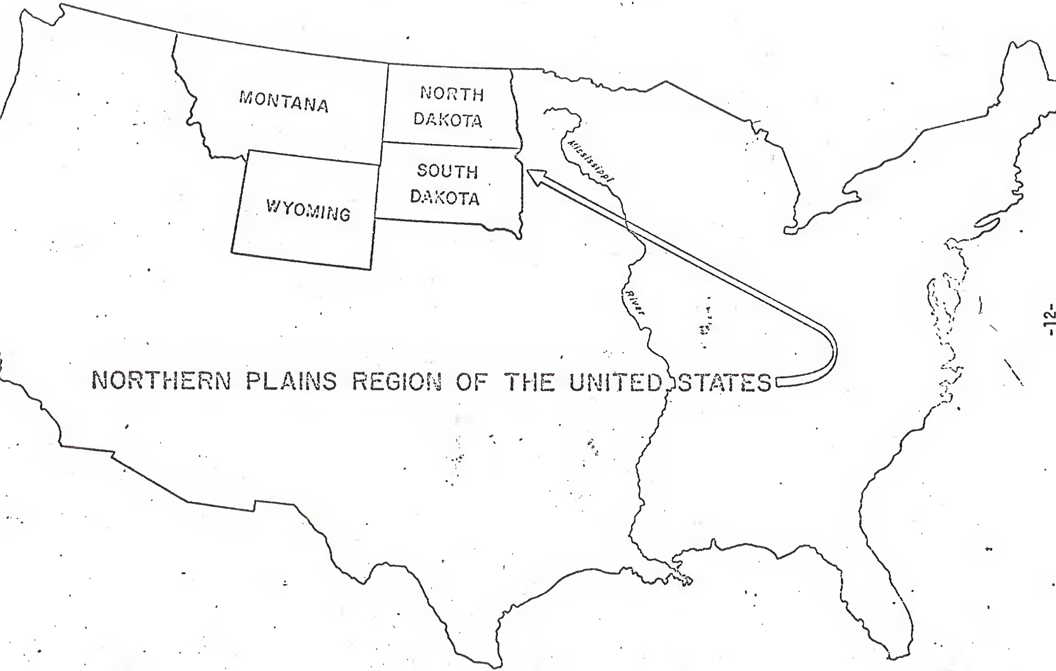
III. A SHIFT WESTWARD

Because of extensive and varied energy reserves, the Northern Plains Region (Figure B) has recently come to the attention of an increasingly energy dependent nation. Oil shale deposits, primarily in Wyoming, amount to about 4 billion recoverable barrels. Such other potential sources of energy as uranium, tar sands and natural gas are found, but are not expected to be available in sufficient quantities to satisfy our nation's energy demands. However, the four-state area of North Dakota, South Dakota, Wyoming and Montana possesses a known coal reserve of nearly 683 billion tons. It is felt an additional 835 billion tons are unmapped and unexplored. The total resource of 1,518 billion tons comprises nearly 50% of this nation's total.

On the basis of both current technology and physical supply, coal is recognized as our most readily available energy source. Coal, therefore, is the major focal point of Project Independence schemes, and western coal is receiving the greatest attention. The interest is such that an East-to-West shift in national coal production is becoming apparent. The reasons for this shift are varied and complex, but in part, relate to abandoning the more expensive and often antiquated underground technology of the east for the quick profits associated with western surface mines. Another often-cited reason is that western coal has a lower sulfur content and thereby facilitates the coal-burning industry's compliance with air quality standards.

The shift to western coal mining brings dangers perceived by U.S. Senate Majority Leader Mike Mansfield, which include declines in capital investments, tax revenues, and secondary industries in both the East and Midwest. A deep Appalachian mine producing one million tons per year employs at least 200 men; the same tonnage can be obtained from a western strip mine by 10 men. (32)

Figure B


MONTANA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
Mississippi
River
NORTHERN PLAINS REGION OF THE UNITED STATES

Arnold Miller, United Mine Workers of America President, has stated that, "A headlong commitment to super-scale Western mining means that over the next five years between 25,000 and 40,000 mining jobs will be lost in the East," and this primarily in areas already relatively depressed, and in a nation suffering from high unemployment. (32)

If one is to analyze this situation further, it can be found that low-sulfur Western coal is not a panacea for air quality problems. Admittedly, a large quantity of Western coal has a low sulfur content. However, this content is on a tonnage, rather than a BTU, basis. Western coal in contrast to Eastern has a lesser BTU content, and it is therefore necessary to burn greater amounts to attain a similar heat value. The net effect is that Western coal, when burned, has a sulfur content approximately similar to that of Eastern coal. However, in that western coal has a lower BTU content, the sulfur oxide emissions, on a BTU basis, are equal or greater. (28)

Ironically, with an East-to-West shift in coal production, coal will be exported from the West to one of the richest coal regions on the earth. According to present estimates, 70% of this nation's 15 trillion-ton coal reserve is west of the Mississippi River. (52) However, if the reserve is estimated on the basis of heat content (BTU's), it can be shown that nearly 55% of the reserve lies east of the Mississippi (14).

Nonetheless, a greater emphasis upon the extraction and conversion of Western energy resources can be foreseen. Toward meeting the energy demands of the nation, net exports of energy from the Northern Plains Region will be substantially increased. The export level of 841.2 trillion BTU's in 1971 can be expected to increase to 2,340 trillion BTU's by the year 2000. (66)

In order to meet this energy increase, greater coal development will be necessary. For example, it has been estimated that national coal production by the year 2000 will increase from the 1971 level of 569 million tons to 1,418 million

tons. (10) The Northern Plains' share of this production will be about 362 million tons, or nearly one-fourth of the total.

Rapidly increasing development of our national coal resource poses many problems, which become especially difficult when one considers the shift from the abundant reserves of the East where an indigenous extraction industry already exists. Forestalling this emphasis would afford the non-industrialized West time to more adequately prepare for a logical transition.

Another element of a rapid and major shift to coal energy relates to the availability of the reserve. Coal has been characterized as our most abundant energy source, capable of lasting for hundreds of years. (38,73) Yet, if there is an overemphasis of this resource, especially on an areal basis (such as the West), the problem of exhaustibility becomes apparent.

On examining three possible development scenarios for the Northern Great Plains Region, the notion of inexhaustibility becomes more mythical than real.

TABLE 2.

Time Necessary to Exhaust Region's Coal Supply at Each Development Level (66)

Development Level	Year 2000 Production (Millions of Tons)	Growth Rate From Year 2000 (%)	Number of Years (from 1975) it Would Take To Exhaust 136 Billion Tons For Each Growth Rate 1/
Base	144	1.9	183
Mixed	362	4.3	92
Extensive	977	6.5	61

1/ 1975-2000 Production Is Included

The base development level assumes that coal will be developed as necessary to meet regional demand, prior committed demand and short-term foreseeable demand. The extensive level, on the other hand, uses such assumptions as low levels of natural gas importation, a 20% (240,000 mw) lag in reaching nuclear generating capacity, and a daily oil shortage of 5 million barrels due to a reduction of oil imports. These estimates reflect the use of both underground and surface mineable coal.

If, however, the focus of development is upon surface mined coal, the periods are substantially shortened. At the base level it will require 136 years to exhaust the 55-billion ton reserve of strippable coal. The times for the mixed and extensive levels are 60 years and 46 years, respectively. Recent remarks by Edwin R. Phelps, president of this nation's largest coal producer, Peabody Coal, would indicate that the latter estimates may become the case:

> The United States not only must continue to have coal, in increasing amounts, but a major portion of that coal must come from surface mines. Surface-mined coal is a public benefit. The needs of our society demand it. (6)

A substantial emphasis upon increased coal production, especially from surface mining, is viewed by many as merely a stop-gap measure. There remain too many uncertainties, and the potential long-term costs of this direction are ominous.

> "As America moves closer to a long-predicted energy crisis, "King Coal" is being called upon to save the country from the power shortages which seem imminent. Many people, however, are beginning to ask if it will be necessary to destroy the land in order to save it." (6)

Montanans are among those posing this question, for the known reserves of low-sulphur subbituminous and lignite coal in the Fort Union coal region of eastern Montana provide great impetus for massive changes.

IV. COAL AND ENERGY DEVELOPMENT IN MONTANA

A. The Extent of the Reserve

The Fort Union Formation of Montana and other Northern Plains states, perhaps the world's largest coal basin, comprises over 40% of our nation's coal reserve. (16) Coal beds ranging in thickness from 25 to 60 feet are common, beds as thick as 80 feet exist, and many of these are obtainable by surface mining.

It has been estimated that 43 billion tons of strippable coal are found in only the Montana portion of the Fort Union Formation, which extends over eighteen counties--nearly one-fourth of the state's land area. (25) Nearly 75% of this

amount, 32 billion tons, is located in a four-county area of southeastern Montana. The areal extent of this component of our strippable reserve is about 770,000 acres. (26)

The potential development of these reserves has ominous social and environmental implications. Yet, if one considers the coal reserves within the entire state, the prospects are even more disquieting. Early estimates of Montana's total coal reserve indicated the existence of 222 billion tons. This reserve, although concentrated in the eastern portion, is found in 35 of our 56 counties and covers 51,000 square miles--about 35% of the State. (68) (The only counties devoid of coal were those located in the western most part of the state.) As if these figures were not sufficiently impressive, a more recent determination has placed our total reserve at 448.6 billion tons. (2)

B. Mining

Coal has been mined in Montana since about 1880. Although mining, largely by stripping, has occurred throughout the eastern part of the state, a large portion of the coal was mined near Colstrip (Figure C) and utilized for steam locomotives. During the period from 1935, the date of earliest record, until 1968, the maximum yearly production was 4,844,000 tons in 1944. After that peak, coal production dropped to a low in 1958 of 305,000 tons. (68) The major causitive forces in this decline were:

(1) The substitution of diesel locomotives for steam-driven,

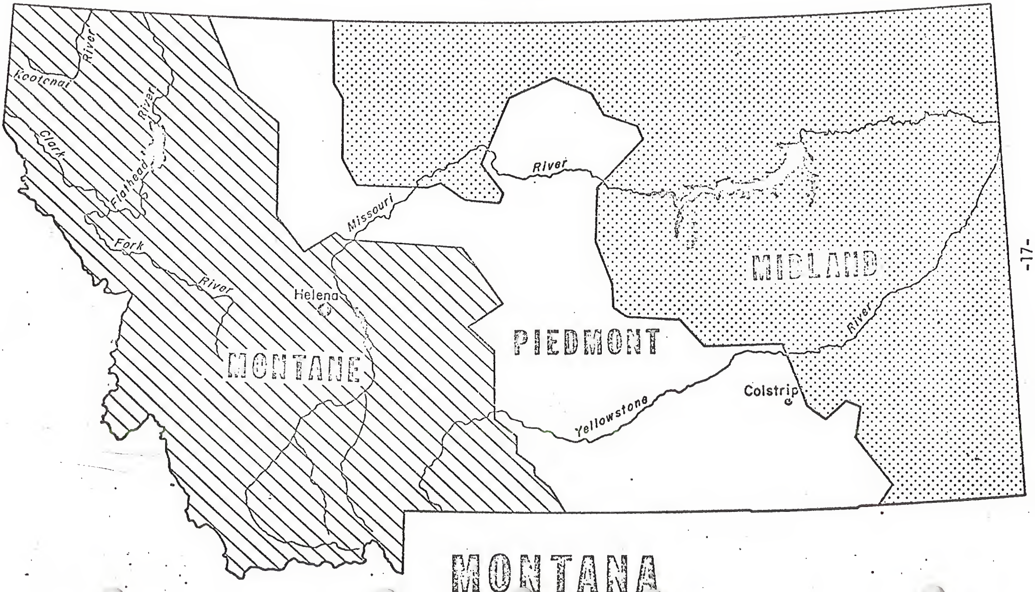
(2) A greater reliance upon oil and natural gas for the generation of electric power,

(3) The increased use of hydroelectric power, and

(4) A greater emphasis upon natural gas and liquefied petroleum gases for residential and commercial heating.

More recently, the downward trend has been reversed, primarily because of greater use of coal in thermal electric generation facilities. A quick examination

Figure C


Kootenai
River
River
Clark
Flathead
Fork
River
Missouri
River
Helena
MONTANE
PIEDMONT
MIDLAND
River
Yellowstone
Colstrip
MONTANA

of the statewide coal production figures illustrates the dramatic nature of recent increases. In 1968, Montana produced 479,483 tons of coal. By 1973, just five years later, production increased over 22 fold to an all-time high of 10,721,413 tons. Production is expected to double in two years to 21,570,000 tons. (36)

Continuing increases in the amount of in-state coal production are expected. Presently coal is surface mined at five eastern Montana sites; most of the coal is being shipped from the state to load center generation plants. Regardless of the nature of development, the amounts are staggering, and it is evident that a high proportion of the coal will be for out-of-state use.

TABLE 3.

Projected Montana Coal Production, By Development Scenario (66)
(In Million Short Tons)

	Base Energy Forecast		Most Probable Forecast		Extensive Development Forecast	
	1*	2**	1	2	1	2
1980	35	26	41	32	64	32
1985	39	28	75	41	153	81
2000	58	30	133	60	393	251

* Total Projected Coal Production
** Coal Requirements for Export

C. Electrical Generation

At present, electrical energy production within Montana results largely from a system of 21 hydroelectric dams, all but five of which are privately owned. Steam plants, gas turbines and internal combustion engines provide the remaining generation. The following table shows the installed generation capacity within Montana and indicates the relative contribution of the various generating methods.

TABLE 4.

Installed Electric Generating Capacity Within Montana (66)
January 1, 1973

Source	Maximum Nameplate Rating (MW)	Percent of Total Capacity
Hydro	1,511.8	80
Steam	314.4	17
Gas Turbine & Internal Combustion Engine	50.9	3
TOTAL	1,877.1	100

At this time, steam generation contributes a small, yet significant portion of total generating capacity, and coal comprises the fuel for three of the seven steam plants. However, the role of coal-fired steam generation could change radically by 1980. Currently, two 350 MW coal fuel plants are under construction near Colstrip. Two additional 700 MW plants have been proposed for the same complex, although they haven't received approval required under Montana law. The electrical energy supplied by this complex alone could be 2100 MW--an amount that exceeds the total current generation capacity of the state by more than 200 MW.

Similar and obviously related to the projected increases in coal mining, the prospects for energy conversion facilities loom ominously. Short-term forecasts show thermal-electric generating capacity in Montana could be as high as 2400 MW by 1980. By the turn of the century, our capacity could again increase, nearly 2.5 times, to a level of 6360 MW. The coal requirements for this level are projected at 28 million tons; the water requirements range from 60,420 to 108,120 acre feet per year. (66)

D. Conversion

Synthetic gas production within Montana could further increase the demand for coal and water. By the year 2000, Montana may be the site of between 6 and

15 synthetic gas plants, each with a production level of 250 million cubic feet per day. The coal necessary to feed these plants each year ranges from 45 to 114 million tons. Water needs have been estimated from as low as 120,000 acre feet per year to as high as 450,000 acre feet per year. (66)

E. Implications

And so, because of increasing energy demands and desire for national energy self-sufficiency, the pressures on Montana's land, water and coal are intensifying. Projections show a rapid and exponential growth in both mining and industrialization, which can have most profound and long-term ramifications.

Because the exact level and nature of coal and energy development have not been defined, and because the degree and extent of impacts are not understood, some would prefer its prohibition. The state has taken the position that mining may continue (in recognition of the national need), but (in recognition of the consequences to Montana) that the conversion or combustion of coal should take place near the nation's high demand centers.

Not many years ago, Montana might have welcomed exponential growth in industrialization, with its large capital investments, the jobs it would create, and the impetus it would give to an economy which has been falling behind the rest of the nation since World War II. That attitude has been supplanted by one of reluctance and resistance. To fully understand the change, it is necessary to understand what Montana has been, and what it could become.

V. MONTANA--AS IT IS, AND AS IT MAY BE

Montana is a unique state with a character that has evolved from rugged, if not violent, beginnings. Vast open spaces and untrammeled landscapes further contribute to the qualities that make up Montana. The state has an infectious allure that overwhelmed the Nobel Prize winning author, John Steinbeck, as he traversed its breadth.

> ...Montana is a great splash of grandeur. The scale is huge but not overpowering. The land is rich with grass and color, and the mountains are the kind I would create if mountains were ever put on my agenda. ...the frantic bustle of America was not in Montana. ...towns were places to live in rather than nervous hives. People had time to pause in their occupations to undertake the passing art of neighborliness. (54)

There is a special and pervasive closeness with the land in Montana. This closeness has been sustained because we have space--space to have a life of meaning and substance. An eminent Montana historian, K. Ross Toole, has carefully examined the psyche of Montana and contrasts its being with the rest of America.

> And so America grew by eating upon itself--by devouring space, by devouring land. But there is no more land; there is no more space to devour. So, what we have left of what we once had has suddenly become precious. And it will become more so until it becomes infinitely precious because we cannot live without it...
>
> Montana is graced with an abundance of that vanishing commodity. It cannot yet (if ever) be translated into dollars. It cannot be measured because it is a thing of the spirit. It cannot really be quantified because it is a quality. (58)

This then is Montana; a land of space and beauty, a land where life does not imply mere existence but rather a thing of quality.

A. Population

Since the 1930's, the trend has been for urban areas to grow with a simultaneous decrese in the rural areas. Nearly 700 thousand people resided in Montana in 1970, an increase from 538 thousand people in 1930. From 1950 to 1968, state population increased by 17%, which is slightly less than half the rate of the Rocky Mountain states as a group and slightly more than half the national growth rate. (70)

A population of 700 thousand is very low in comparison to that of other states. In the past, this figure, coupled with the rate of population growth, was a cause of concern. Today people realize that low population and slow growth have spared Montana from many of the social and environmental problems experienced in other areas--but increases in population exceeding ½ million have been projected from energy development alone.(64) If so, the values attendant to a sparsely populated region--clear air, open space recreation, abundant wildlife, an enviable life style, aesthetics--would be diminished.

B. Economy

The economy of the state has been traditionally dependent on a natural resource base--agriculture, minerals, forestry, and, particularly in certain areas, recreation and tourism. Prior to 1950, two industries, agriculture and mining, were the backbone of the economy. More recently, these two activities have declined relatively as sources of employment and income, while services employment (government, education and other professional fields, transportation and utilities) has increased. (70)

Nevertheless, agriculture continues to be Montana's largest basic industry, producing well over 1 billion dollars of income in 1973 and exceeding the combined marketing revenue of the state's next five largest industries.

TABLE 5

Valuation of Industries #2 Through #6

2.	Mining, Including Coal	$ 362.5 million
3.	Manufacturing	$ 330.4 million
4.	Tourism	$ 231.4 million
5.	Oil	$ 104.0 million
6.	Lumber	$ 85.3 million
		$1,113.6 million

In 1969, domestic animals accounted for 66% of total farm income, while crops contributed nearly 34%. (34) Cattle raising is the principal livestock activity, producing $472 million in 1973, and wheat is the major crop, valued at $391 million in the same year. (49)

The agricultural economy is compatible with and contributes greatly to the maintenance of many significant components of our lifestyle, including open space, wildlife habitat and clear air. Simultaneously, low population density is allowed, and an essential sustaining commodity, food, is provided.

Between 1950 and 1967 employment increased by only 14%, while the average was 33% nationally and 41% for the Rocky Mountain states. (70) In addition, Montana per-capita income, 93% of the national average in 1959, had fallen to 85% by 1969. (34) Limited job opportunities and low income levels are the price paid for slow growth, but indications are that many residents are willing to accept less monetary reward in order to live in the quality environment of Montana and experience the western way of life.

To greatly expand both industry and agriculture in Montana is not possible, for there are too many competing demands for land and water. Because of our rural heritage and the tangible economic values and intangible environmental and social values provided, Montanans indicate a strong desire to continue the agricultural base and character of our state.

C. Land Resource

Montana, the nation's fourth largest state, averages 550 miles in length and 275 miles in width for a total of 93,217,040 acres or 145,651 square miles. (35)

1. Ownership

Federal land management agencies administer 29.6% of the total area, and state agencies and institutions administer 6.5%. Indian Reservation land makes up another 6.9%, while the remaining 57% is held in private ownership. During the period from 1958 to 1967, Federal lands decreased by 620 thousand acres, mainly as the result of the sale and disposition of isolated tracts to private owners. (62)

2. Land Use

Land uses have been inventoried for 70% of Montana's land area, most of which consists of non-federal lands. A summary of the inventoried acreage is shown in Table 6.

TABLE 6 (62)

INVENTORY ACREAGE

	Acres	Percentage of Land Inventoried
Cropland	14,988,775	22%
Range and Pasture	43,005,287	66%
Woodlands	7,003,910	11%
Other Lands*	520,206	1%
TOTALS	65,518,178	100%

* Other lands include farmsteads, private roads, feed lots, ditch banks, rural non-farm residences, mine wastes, barrow pits and investment tracts.

Dryland crops, mainly small grain and fallow, make up 89% of the cropland; the remainder is irrigated. Range and pasture land consists of 96% range and 4% pasture. Although rangeland is found throughout the state, it dominates the eastern prairies and is essentially all dryland. About one-third of the pasture land is irrigated. Woodlands are principally found in the montane and intermontane regions. (Figure C) Commercial forests account for 87% of the inventoried acreage of woodland. (62)

3. Trends

Montana is witnessing an intensification in use of the land. With each passing day, more forest, range, cropland, and wildlife habitat is lost to urban sprawl, rural subdivision and second home recreation developments, strip mining, transmission lines, and a variety of other uses. If these trends continue at their present rate, serious effects can be expected on the long-run productivity of Montana's lands.

D. Water Use (34)

Irrigation accounts for 98% of all water consumed in Montana, and surface water is the primary source of supply. Municipal, industrial, rural domestic and livestock watering account for the remaining 2%.

1. Irrigation

Over 3 million acre feet of water is needed annually for irrigation, which requires a diversion of 12.4 million acre feet to assure the necessary water in the field. In general, peak water requirements are during the July and August growing season, when streamflows are low. During this period water supplies are insufficient in many areas.

Currently water is used to produce crops on over 2.5 million acres of agricultural land, but this figure decreases by as much as 300 thousand acres in dry years. The land developed by federal and state irrigation projects totals an estimated 900 thousand acres, leaving about 1.6 million acres of private irrigation development in the state.

An additional 11.5 million acres are potentially irrigable in Montana, but the amount of that acreage which will actually be developed is already limited by water availability. Further restrictions come about because of competing land and water uses. For example, irrigable and irrigated lands, especially along populated river valleys, are being lost to urban sprawl and the proliferation of rural subdivisions.

2. Energy Development

Energy development, if it proceeds at the scale projected, will need massive quantities of water from the Yellowstone and other river basins of eastern Montana. Already pressure for water for this purpose is far greater than anticipated. For example, in 1972 the Bureau of Reclamation's Montana-Wyoming Aqueduct Study projected a water demand of 2.6 million acre feet annually by the year 2002. (64) Less than two years have passed, but options, applications and requests for water in the Yellowstone Basin have already far exceeded that figure, totaling over 3 million

acre feet. (41)

Although in an average year 9 million acre feet flow from this basin, the lowest annual discharge on record was 4.2 million acre feet. (65) Large demands threaten to foreclose future agricultural options by appropriating all excess waters and by driving the price of water beyond the means of irrigators. Furthermore, such demands, if granted, could exceed critical minimum flows and jeopardize existing rights.

The demands for energy development have been an important catalyst, shocking Montanans into a heightened awareness of the importance of water, not only for agriculture, wildlife, forests, and livestock, but also for a way of life that has long since come to an end in much of the nation.

E. Social

Montana can be largely characterized by its rural setting. The small, predominating rural towns and the presence of but few large trade centers are directly related to the role of agriculture in our state.

With the growth of coal and energy development, residents of southeastern Montana, who once knew only warm, personal relationships, are beginning to find themselves strangers in their own communities. Traditionally strong family ties are being weakened, and a homogeneous social structure is being replaced by distinct stratifications. Incidents of crime and divorce are increasing. Some cultural segments feel their identity will be lost forever. Jim King, a member of the Northern Cheyenne Landowners Association, recently noted that their tribe is not large and, "If coal companies come in they would vanish us." (39)

Small communities are reaching legal bonding limits as they endeavor to provide adequate education, water supplies and sewage treatment facilities. Transportation, health care, law enforcement and government services are becoming inadequate. Local officials are finding their institutions and facilities unable to accommodate rapid growth and profound change.

F. Political

Population is sparse in southeastern Montana, but representatives elected from that region will generally vote to reflect the area's values, by supporting agricultural measures in the annual Legislative Assemblies. With accelerated energy development would come an influx of persons with industrial interests, who will cast their votes in favor of candidates sympathetic to such causes (and possibly better able to finance campaigns than rural contenders).

In time, and depending upon such factors as the degree of industrial growth, the balances of interest groups in the State Senate and House could be altered. The result could be a decrease in the number of successful environmental and agricultural bills and an increase in legislation enacted in the interests of big business.

As state laws become more favorable, perhaps especially in revenue matters, additional companies would be encouraged to locate in Montana, bringing with them still further shifts in state political power, which eventually could be reflected in our representation in Washington, D. C. The end could conceivably be the total metamorphosis of Montana from an agricultural to an industrial society.

G. Water Quality (34)

Generally the surface waters of the state are rated from good to excellent in both chemical and bacterial quality. Exceptions include local bacterial contamination from municipal and feedlot discharges, chemical and toxicity problems from mining and petroleum operations, and suspended sediments from improper land use activities. In the localized areas where pollution has occurred, deterioration of the quality of water supplies, damage to fish habitat, and diminished aesthetic values have resulted. However, disregarding localized problems, water quality is very good in comparison to that in other areas of the country.

Given projected increases in resource demands and associated growing populations, many factors may detrimentally affect water quality. Consequences could include runoff and seepage from mines, thermal pollution, decreases in low base flows, irrigation drainage and return flows, saline seep caused by excess

moisture in salt laden soils, and sedimentation.

Montanans strongly desire to maintain or improve present water quality. However, if the state's future includes rapid growth and industrialization, this may be impossible--judging from the industrialized areas of the nation.

H. Air Quality

Most of Montana has pristine air quality. Exceptions are a few isolated mountain valleys where industrial activity is concentrated. Large scale energy development, however, could change the situation. Our citizens are aware of the four corners area (common corner of Utah, Colorado, Arizona and New Mexico), with its numerous coal fired generation plants and attendant air pollution problems. They feel, based on this dramatic example, that if numerous power plants are built on our eastern prairies, polluted skies will result.

I. Fish and Wildlife

Montana is generously blessed with high quality fish and game habitat, and wildlife is an important part of the heritage of the state. Of the state's 93 million acres, most land not urbanized provides a variety of habitat.

1. Present Standing

a. Fisheries

The opportunity for high quality, uncrowded fishing amidst scenic surroundings is an outstanding characteristic of the state, and residents and visitors spend approximately 2.6 million days annually fishing in Montana. (27) Fisheries habitat includes approximately 15,000 miles of streams, of which 1,441 miles have been identified as prime trout streams and 1,344 miles are warm water streams. (34) The remaining flowing waters afford excellent to fair fisheries. In addition, stored water furnishes habitat for various species.

The rivers and streams of the Yellowstone, Missouri, Clark Fork and Kootenai River Basins (Figure C) harbor trout (cutthroat, eastern brook, rainbow, brown, and Dolly Varden), salmon of the landlocked variety, whitefish, and grayling. Warm water species of the lower reaches of the Missouri and Yellowstone Rivers include sauger, walleye and northern pike, sunfish, crappie, yellow perch, and the prehistoric paddlefish.

b. Big Game Animals

Montana, a land of great expanses and few people, provides wildlife a diversity of habitat--prairies, mountains and river valleys. The most common game species, and with the widest distribution, is the mule deer. White-tailed deer are found in northwestern Montana, in the foothills of central Montana and along the river valleys. Elk, less tolerant of man, are distributed principally in the forested areas of the montane and piedmont regions. Moose, with expanding distributions, are now common in northwestern and southwestern Montana. Pronghorn antelope, found in prairie habitat, are distributed almost throughout the state. Big horn sheep now mainly inhabit the mountain ranges, as do Rocky Mountain goats. Black bear populations are sizeable in their native habitat in the western part of the state.

Montana has the largest remaining grizzly bear population in the nation, with the exception of Alaska. Whereas other, more developed western states like Arizona, California, and New Mexico have lost the grizzly, Montana, with precious wilderness and roadless lands, offers a refuge to this majestic and rare animal. However, even in Montana the grizzly has been forced from the plains.

c. Game Birds

Ten species of upland game birds occur in Montana. The six species native to the state are white-tailed ptarmigan, spruce (Franklin's) grouse, ruffed grouse, blue grouse, sharp-tailed grouse, and sage grouse. Introduced species include ring-necked pheasant, Hungarian (grey) partridge, Merriman's turkey and chukar partridge.

Waterfowl are considered an international resource. Birds from two flyways pass through Montana, and across state and national boundaries between nesting and wintering areas. The important migratory birds are ducks, mergansers, geese and swans. Of the 48 species in this family on the North American continent, 33 species have been recorded in Montana, (2 of swans, 5 of geese, 3 of mergansers and 23 of ducks). (33)

Montana is situated on the edge of the finest waterfowl breeding range in North America. Numerous wildlife refuges, lakes and ponds within the state serve as nesting sites. Duck population densities in certain areas, especially the lower Flathead Valley and the northern glaciated prairies of eastern Montana, compare favorably with the best in the continent. Mountain areas, with many streams, lakes and beaver dams, supplement the number of breeding waterfowl.

The future for the waterfowl resource in Montana is promising, even though habitat has suffered from man-made changes. Marsh lands and potholes have been drained and filled to make land more suitable for man's uses. Impoundments and alterations of natural stream channels have also reduced habitat.

e. Endangered Species

Montana harbors vestiges of four endangered species, the American peregrine falcon, the whooping crane, the Northern Rocky Mountain wolf and the black-footed ferret. The future of these species is totally dependent on man's sensitivity.

2. Prospects

Habitat is crucial in maintaining viable fish and wildlife populations; therefore, careful consideration must be given to preserving habitat in land and water management decisions. The constant pressure to derive short-term profit from the land could extract an irreversible price--for both wildlife and future

generations. As the eminent ecologist, Aldo Leopold, said, "Harmony with the land is like harmony with a friend; you cannot cherish his right hand and chop off his left." (33)

J. Recreation

Montana, a land of diverse landscapes, varied seasons and abundant wildlife, provides numerous outdoor recreation activities in settings of exceptional beauty and spaciousness. As the seasons change, so do the opportunities for recreational pursuits. Summer activities dependent on warm weather, like swimming, hiking, boating, camping and fishing, give way to the enjoyment of big game and waterfowl hunting in the fall, and the winter's snow allows a variety of outdoor recreation.

Outdoor recreation is a major component of Montana's economy, but of greater importance than dollars are the unquantifiable natural values themselves. These values include variety, beauty, wildness, wildlife, clean air, unpolluted streams, and relief from congestion--all contributing to the enhanced man-nature relationship that seems to exist in the state. Such qualities are priceless common resources that must be shared and preserved, but protection is becoming difficult. Even the use and enjoyment of the natural environment tends to affect its quality.

For the past 30 years, use of the outdoors has increased. Greater mobility, leisure and income, together with expanding numbers of people, have created this upswing while concurrently threatening Montana's recreational values. Campgrounds are often congested. Prime trout habitat is being lost to rip rapping, dewatering, channelization, and sometimes pollution. Marketing of second home sites in undeveloped areas is increasing, which tends to diminish diverse natural landscapes supporting wildlife and replace them with open space consuming, resource depleting sprawl. The list of threats to quality outdoor environment is long and growing.

In the future, Montana expects greater use of the outdoors for the pleasure of our residents and visitors. If the state becomes industrialized in response to national demands, then additional pressures will result, possibly in such a magnitude that,even with restrictions, our natural beauty and quality of life will be degraded. In turn, Montana's outstanding recreational opportunities will be diminished.

VI. OTHER PRESSURES

Montana, then, is in the midst of an upheaval which affects virtually every element of our social and natural systems. The prime impetus for change originates in the demand for our coal resource. Serious and obvious as are the problems posed by this energy development, they are compounded, and our transition accelerated, by additional developmental pressures which, in turn, create additional demands for additional energy.

A. Subdivision and Second Home Development

Montana, like most other western states, is experiencing rapid, essentially uncontrolled land development. Although no one knows the exact amount of land involved, it is safe to say that hundreds of thousands of acres have been subdivided throughout Montana since 1970. Between February 1, 1972, and April 30, 1974, alone, 367 subdivisions totaling 11,728 acres were reviewed by the state, and the vast majority of subdivision activity falls outside of state jurisdiction.(8)

Agriculture is seriously threatened by the conversion of productive land to other uses, notably residential subdivisions. Ironically, those level, well-drained lands which pose the least physical limitations to development are also the most valuable for production of food and fiber. Although this trend is occurring throughout the state, it is most evident in the fertile valleys surrounding larger cities.

Critical wildlife habitat, watersheds and productive forest lands have also been lost. Because people prefer to locate near water, fragile water-wetland systems (lakes, streams, marshes, groundwater recharge areas and aquifers), least able to withstand impairment, are subjected to the greatest development pressures. In some cases, construction has taken place on unstable slopes, seismic-risk areas and floodplains, where natural hazards endanger life and property. Still other developments impact historical, aesthetic and cultural values.

Control of rural subdivision activity at both the state and local level is inadequate. Also lacking is the means to accurately quantify and monitor its magnitude and rate, since existing laws allow many land divisions to escape any kind of public review and recordation.

Because the division of the land resource into a marketplace commodity usually occurs in a slow scattered manner, the drastic changes in land use associated with subdivision development are not readily apparent until after-the-fact. Legislative solutions are difficult to obtain, since the image of the "small" local land developer fails to generate the same sense of urgency that exists with regard to large, highly visible and widely publicized development. Yet, the cumulative effects of many "small" developers acting randomly can be awesome.

Many subdivisions are not planned to meet legitimate housing needs, but rather are designed to produce maximum short-run economic benefit. And the typical land buyer is preoccupied with his own desires, not with the quality of the common environment. The problem is aggravated by countless individual decisions, unrelated but interdependent, and oriented toward the maximization of personal gain rather than broader societal and natural considerations.

As people build second and third homes, the implications with regard to resource shortages and devastation of natural amenities become increasingly evident but have not yet been broadly recognized. The second home in the forest gives additional impetus to new power generation plants, transmission lines, clearcutting, increased stream siltation, and the loss of wilderness values. Unfortunately, these external costs are not reflected in the price paid by individuals for subdivision lots, but must be borne by the public in general.(18)

B. Recreation Development

Large scale recreation development, which has been introduced only recently to Montana, is most pronounced in Montana's beautiful but rapidly changing western valleys. Characteristically energy-intensive and second home oriented, such

development represents a drastic intensification of land use in an otherwise primitive setting. Typically, private land holdings are located near and advertise the utilization of scenic public lands. The influx of this type of development and the numbers of people attracted tend to diminish Montana's amenity values, such as wildlife and solitude, and multiply demands for energy and other resources.

C. Demands on Other Resources

Resource uses are inter-related, and there are considerable impacts on all physical and amenity resources in Montana as a result of increasing growth. For example, more timber and mineral resources are needed for such structures as rural subdivisions and transmission lines. The harvesting or extraction, transportation and processing of more timber, copper, etc., requires more energy. Additional energy plants in turn create their own demands for more of the same raw materials. We are thus enmeshed in a vicious circle of resource extraction, utilization and consumption.

VII. EFFORTS TO CONTROL RESOURCE DEVELOPMENT AND ENVIRONMENTAL DEGRADATION

A. Accomplishments

The growing intensity of the demands for Montana's land, water, timber, metals and fossil fuels could alter the very essence of a comparatively undeveloped and unspoiled state. The people, through state government, have acted to preserve cherished characteristics, prevent the kind of social, environmental and economic wrenchings witnessed in other rapidly exploited areas, and uphold our responsibilities to future generations. Some of the most relevant measures to date are summarized below.

1. General

a. Executive Reorganization--The executive branch of state government has been reorganized to increase efficiency, eliminate duplication, and maximize the effectiveness of Montana's limited economic, political and human resources.

b. Constitution--Article IX, Section 1(3) of the new (1972) Montana Constitution states that "The legislature shall provide adequate remedies for the protection of the environmental life support system from degradation and provide adequate remedies to prevent unreasonable depletion and degradation of natural resources."

c. Montana Environmental Policy Act (MEPA)--Inherent in MEPA are the intents that adverse environmental impacts be minimized and that all alternatives to a given development be given thorough consideration before a decision is made. State agencies are directed to "...fulfill the responsibilities of each generation as trustee of the environment for succeeding generations...maintain, wherever possible, an environment which supports diversity and variety of individual choice... and enhance the quality of renewable resources."

d. Councils--The Environmental Quality Council (EQC), an arm of the legislature, has been created to monitor state agency activities affecting the environment and to ensure their compliance with MEPA. The Land Use Advisory Council and the Energy Advisory Council, consisting of state agency representatives, will

provide input from the executive branch to the EQC in its comprehensive studies to formulate state land use and energy policies.

2. Mining Legislation

a. The Coal Conservation Act--The first of its kind in the United States, this bill ensures that coal will not be wasted and that land, once reclaimed, will not again be disturbed to recover a previously unmined seam.

b. The Montana Strip Mining and Reclamation Act--Described as the strongest reclamation law in our country's history, this law gives us far greater control over disruption of our land through control over the method of operation, annual permits, selective denial of permits to mine land with special characteristics, a total ban on contour strip mining, and mandatory establishment of a permanent, diverse vegetative cover.

c. Montana Strip Mine Siting Act--This act gives state government the authority to examine and approve or disapprove the site of a proposed new strip mine prior to any large-scale investment and development.

d. Revenue Measures--Several tax measures were enacted to provide a more equitable return today for exploited non-renewable resources. House Bill 509, for example, increased strip mine license tax rates between 100 and 325%, depending on the BTU rating of the coal mined. The tax rate now ranges from 12 to 40 cents per ton, with the first 5,000 tons mined by a given company exempt.

The Resources Indemnity Trust Act provides that industries mining non-renewable resources pay an annual tax of $25 plus .5% of the gross value over $5,000 of the product extracted. The proceeds will be deposited in a special account, invested, and eventually appropriated by the State Legislature for environmental improvement.

3. Industrialization Legislation

a. Montana Utility Siting Act--This law authorizes regulation of the planning, location, construction and operation of energy plants and their associated facilities in order to minimize their possible adverse impacts on the people and the

environment of Montana. Sufficient funds, will be generated, through a special tax and filing fees, to make meaningful the evaluations required. Long-range (10 year) plans must be submitted annually by utilities.

b. Pollution--Our water pollution control laws have been strengthened, and steps have been taken to preserve the quality of our comparatively clear air.

4. Water Legislation

a. Montana Water Use Act--Under this Act, existing water rights will be confirmed through court adjudication, and a permit is required before water can be appropriated for new uses. Procedures are more stringent, all records are centralized, and all waters (surface, ground and geothermal) are included in one administrative system.

b. Water Moratorium--This law suspends for three years the processing of applications for large volumes of water from the Yellowstone River Basin, the focal energy development region. However, reservations of water for future beneficial uses may be made by various governmental organizations.

5. Land Use Legislation

a. Montana Subdivision and Platting Act--Subdivisions of two or more parcels, at least one of which is less than 20 acres in size, will be regulated at the local level, and environmental analyses are required of developers.

b. Montana Natural Areas Act--Areas relatively untouched by man and possessing unique scenic, educational, scientific, biological or geological values will be preserved through acquisition by the state and designation by the legislature.

c. Floodplain Management and Regulation Act--Man's use of the land within 100-year flood boundaries will be regulated, representing a significant departure from the former emphasis on attempting to regulate nature through dams, dikes, levees and similar structural projects.

B. Needs

1. Legislation

a. Existing--Commendable as such laws are, many could be strengthened

through amendments. Provision could be made for denials under both the Water Use Act and the Utility Siting Act, for example, on the basis of the public good. The acreage limitation could be removed from the Subdivision and Platting Act.

b. New--Many additional measures could contribute further to resource stewardship and environmental quality. With regard to forest management, for example, only practices on state-owned lands are regulated, and privately owned forests are sometimes, often unknowingly, abused. A forest practices act was introduced but defeated, as were bills concerning lakeshore protection, streambank preservation, wild and scenic rivers, and critical areas. Subdivision activity should be suspended, pending the completion of a statewide critical areas inventory and enactment of a measure to protect such areas.

2. Realizations

The laws Montana has adopted, together with the amendments and the new enactments we may adopt, will not be sufficient to overcome the myriad challenges facing our state. First, their chief import is mitigation of damages which have already occurred. Problems should be anticipated and circumvented, rather than alleviated by remedial measures.

Second, our approach to any one category can still be termed disjointed. Different phases of land use planning, for example, have become the perogative of a vast number of federal, state, local and private groups, and individuals. Better coordination of programs is essential.

Third, and as should be obvious whenever a moratorium is approved, we are in truth often buying time rather than solving a problem. That time may be invaluable, though, for in many cases answers do not yet exist, and much research and planning will be necessarybefore solutions can be proposed.

Fourth, we must realize that our effectiveness is at best limited. For example, large amounts of coal underlie Federal land and may not be subject to state enactments. Efforts have been and are being made to preempt state authority in a number of key environmental areas, including air quality and reclamation standards,

and Montana's desires may well be subordinated to what is seen as a national need.

Fifth, and most crucial, we must realize the steps we have taken are in fact attempts to treat a symptom. Needed is a cure for the disease, for it is uncontrolled growth, in the final analysis, which lies at the root of not only Montana's problems but those which must be confronted by the world community.

VIII. DEALING WITH THE FUTURE

A. The Need for a Method

Extremely rapid growth involves desirable features such as jobs, income, trade, and tax revenues. However, it also involves disruption of established cultural and social systems, excessive pressures on governmental and public services (law enforcement, fire protection, sewage and solid waste disposal), long-term damage to natural environments, and excessive consumption of finite resources.

Implicit in many of the laws adopted by Montanans is the assumption that growth should be controlled or directed in some manner, and that such direction should come at the state government level. Thus far, however, only piecemeal actions have been taken, in response to numerous problems which are only manifestations of the overall problem. Comprehensive policies in accordance with statewide goals will be needed.

Certainly we have passed the point where we can proceed in the absence of goals, allowing the future of Montana to be shaped primarily in the market place. Demands for our coal, copper, natural gas, timber and land are external, and far higher than would be necessary to satisfy the needs of our state's population. Without direction, growth will be rapid and exclusively profit-oriented. Although we recognize our responsibility toward this and other nations, the desires and best interests of Montanans cannot be ignored.

We have also passed the point where policies could be formulated exclusively through the technical skills of governments and universities. Issues arise quickly, and responsive action cannot be delayed until the next election day. Because technically plausible solutions may not be socially the most desirable solutions, and because the public is well-informed and able to assume a prominent role, any mechanism to direct growth should provide ample and continuing opportunities for public participation.

Montanans have realized that growth, rather than being a panacea for our problems, is in fact causing them. We realize that the laws we have passed, and those we may yet enact, will not in themselves be sufficient to cope with the transitions we are experiencing. We are beginning to realize that conventional methods will not be adequate to confront extraordinary situations, and we are searching for the innovative, the unconventional.

B. A Possible Goal Formulation and Monitoring Process

With the rapid rate of change, no one can predict exactly what living in Montana will be like in 25 or 50 years. A unified set of goals is necessary if the citizens of Montana are to determine their future. Unless we take significant and bold steps in such an undertaking, the future of our state may be determined by routine prescriptions, with the present and tomorrow shaped by incremental, laissez-faire, and non-decisions. The decision to do nothing about a problem is a decision just the same.

However, issues like population, economic growth, maintenance of environmental quality, social welfare, land use and resource consumption cannot be isolated, with respective goals and policies being formulated independently at separate points in time. Such issues are interrelated, and any general policy or specific decisions in any one area will affect all the others. The inter-dependence of policy decisions is illustrated in Table 7, using examples from the fields of transportation and energy.

TABLE 7

Examples of Policy Interrelationships

Policy	Secondary Implications
Encourage Use of Automobiles Through Massive Public Subsidation of Highway Construction	Agricultural Lands and Wildlife Habitat are Converted to Highways Urban Sprawl Is Encouraged Traffic Congestion Is Increased More Energy Is Consumed Exhaust Emissions Are Increased
Encourage Energy Conservation	Industrial Growth Is Restricted Energy Is More Expensive Second Home Construction Is Reduced Demands for Power Plants, Transmission Lines, Strip Mines, and Industrial Use of Water are Reduced

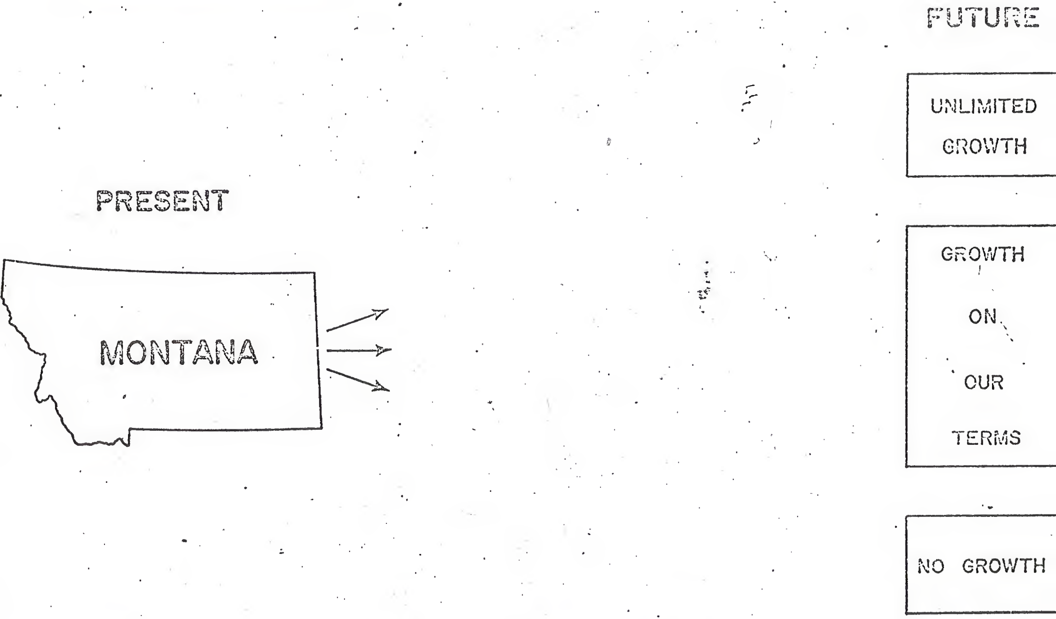
Therefore, it is important that a process of overall social goal determination be developed and implemented.

Goals for the state can be developed within the context of alternative futures. Once acceptable goals are decided, policy can be implemented by all levels of government to promote their achievement.

Figure D represents the range of futures open to Montana.

FIGURE D

THE RANGE OF ALTERNATIVE FUTURES



As can be seen, we can adopt a policy of uncontrolled growth, growth on our terms, or no growth. The first and third alternatives are the extremes--the former involving no effort to direct growth, and the latter involving all conceivable efforts. Growth on our terms is, in fact, not a single alternative, but embodies an infinite variation of levels lying between the extremes. Judging from legislation recently enacted in Montana, the people desire some intermediate level of development.

Determining more precisely the exact level of growth desired, then, is the key to articulation of social goals. Partial answers to this question are already availablefrom a variety of sources. The Constitution and state codes are a principal source of information regarding the citizens' desires. Opinions in areas not covered by law have been or can be obtained by a variety of means, including public hearings, meetings, forums, questionnaires, citizens advocates, citizen boards and commissions, and referendums.

Government, besides listening to and analyzing public input, must also provide the citizens with specific and rather technical information not generally available. Wise decisions depend on a public understanding of:

(1) The need for goals regarding the future of the state,

(2) The options that are available (unlimited growth, controlled growth, no growth), and

(3) The costs, benefits, tradeoffs, and impacts of each option.

The third is most difficult. Trade-off analysis can be very complex and is generally beyond the capability of the public at large, especially in long-term planning situations. It is incumbent on government and its body of technical expertise to describe and quantify the expected results of different policies and specific actions to the public,who will ultimately reap the benefits and pay the costs of the decisions.

To some extent, this is now being done by Montana government. Examples include environmental impact statements (which now consider social and economic effects) and the statement of public need and environmental compatibility required by the plant siting authority in the Department of Natural Resources and Conservation. Some of the planning activities, such as the State Water Plan, are using alternative futures analyses in the form of different sets of economic projections which could possibly occur.

Leadership must be taken by state government in goal formulation and attainment. Currently policy decisions are made in a variety of agencies and bureaus, but in the absence of overall specific goals. Therefore, efforts may sometimes be inconsistent. An alternative is to designate one unit, having as its only duty the responsibility for monitoring our citizen's desires for the state, assisting in the transformation of this input into a statement of state goals, and evaluating the attainment of those goals. For purposes of discussion, this entity will be termed the "Goals Commission."

Goals, then, will be formulated by both the legislative and executive branches of state government, local governmentaland private interest groups and organizations, and the populace. Their exact articulation will be aided by the Goals Commission. Thereafter, all actions should be harmonious, in that they are taken within the framework of a unified set of objectives.

Figure E illustrates the first step, a statement of simplified alternative future goals, which are general rather than action-oriented.

A general statement of the kinds of actions and policies the state can adopt to reach those goals is presented in Figure F.

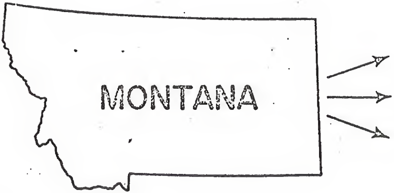
Figure G, "Specific Elements of Alternative Goals," is a statement of more detailed sub-goals or strategies.

Specific actions to attain those sub-goals are presented in Figure H.

FIGURE E

GENERAL GOALS

PRESENT



FUTURE

Economic prosperity, jobs, people, money.

UNLIMITED GROWTH

Economic satisfaction, but not at the expense of a quality life in Montana.

GROWTH ON OUR TERMS

Rural characteristics. High quality natural amenities. Economic prosperity a secondary consideration.

NO GROWTH

FIGURE F

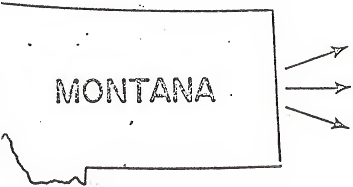
GENERAL STATEMENTS OF ACTIONS AND POLICIES

FUTURE

The state takes little, if any, action which would direct, delay, or discourage economic activity in any form.

UNLIMITED GROWTH

PRESENT



The state carefully takes actions controlling certain activities. Some activities could be severely restricted; others, mildly or not at all. Any action available to government (under existing or new legislation) could be used, including taxation, rules and regulations, zoning, plant siting, etc.

GROWTH ON OUR TERMS

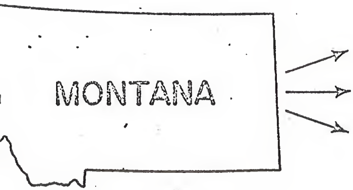
The state would take every action legally available to it to discourage the formation, location, or expansion of industry and population in Montana.

NO GROWTH

FIGURE G

SPECIFIC ELEMENTS OF ALTERNATIVE GOALS

PRESENT



FUTURE

UNLIMITED GROWTH

a. Maximize the number of jobs.
b. Maximize the per capita income.
c. Maximize material affluence.
d. Maximize resource development.
e. Encourage industrialization.
f. Promote the highest value short-term economic use of land and other resources.
g. Promote in-migration.
h. Minimize environmental safe guards.

GROWTH ON OUR TERMS

a. Maintain agrarian tradition.
b. Promote open space, with people and development concentrated in existing cities and towns.
c. Internalize social and environmental costs as a prerequisite to acceptable business activity.
d. Encourage hiring of Montanans first.
e. Encourage a growing understanding of man's relationship with the environment of Montana.
f. Encourage the recognition that per capita income is a poor index for comparing Montana's quality of life to that of other areas.
g. Determine quality of life indices and monitor them so that undesirable changes do not occur.

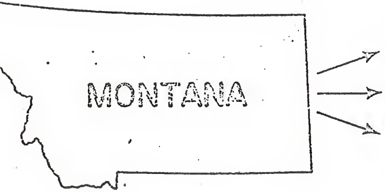
NO GROWTH

a. Discourage capital investment.
b. Discourage labor-intensive activities.
c. Discourage population influx.
d. Internalize all social and environmental costs.
e. Discourage (or prohibit) corporate ownership and control of resources.

FIGURE H

SPECIFIC ACTIONS FOR GOAL ACHIEVEMENT

PRESENT



FUTURE

UNLIMITED GROWTH

a. Extensive relaxation of state regulation of private enterprise.
b. Relaxation of subdivision regulations to enable the rapid development of suburban and exurban lands.
c. Implementation of a public information program to promote the natural beauty and amenities available in Montana.
d. Repeal of the strip mining, rock mining, and utility siting legislation.
e. Repeal of the Yellowstone River moratorium on large scale water diversions.
f. Relaxation or removal of air quality regulations.

GROWTH ON OUR TERMS

a. Careful regulation of private enterprise to ensure fairness to Montanans.
b. Development and promulgation of subdivision rules and regulations.
c. Extensive research in government and the universities concerning the trade-offs of alternative policies.
d. Coal mining for our needs and export only.
e. Coal processing for our needs only (with needs being carefully defined).
f. Stringent controls to ensure that reclamation, social, cultural, and economic mitigation, and other remedies to general system disruption are necessary in corporate operations.
g. Commitment to energy (and other resource) conservation.
h. Encouragement of diversity--designing programs so that communities setting their goals above the minimum have some hope of achieving them.
i. Priority on renewable resource use.
j. Encouragement of alternative energy forms and sources.
k. Encouragement of alternative modes of transportation.

NO GROWTH

Minimal coal mining and processing.
Implementation of a public information program to cultivate our reputation for high cost of living,

When policy is desired concerning any one topic, relevant objectives and actions are simply abstracted from the already adopted, overall growth policy. Using energy as an example, and assuming we have adopted "Growth on Our Terms" as the future we desire, relevant policy from Figure H would include entry (a) "Careful regulation of the energy industry to ensure fairness to Montanans," entry (d) "Coal mining for our needs and export only," etc.

To ensure that actions of state agencies are in harmony with these goals and policies, the Goals Commission should have total accessibility to the Governor. Leadership could be in his office or in an executive branch agency. Because of the potential for conflict of interests, members must be as neutral as possible, and membership should be periodically rotated. Participants on the technical team could be specialists from throughout state government and the universities, detailed on special, full-time assignment from their regular duties but with their normal jobs available upon their return.

Most phases of the Goals Commission's responsibility must be continuous and simultaneous. State goal formulation should be dynamic, continually adjusting to changes in citizens' desires as they react to changing situations. Monitoring the success of achieving the goals should also be an on-going process. Only reporting the successes and failures, and making recommendations to the Governor and the Legislature, would be accomplished periodically but regularly.

To fulfill its responsibilities, the Goals Commission will of necessity work closely with and obtain feedback from the public. As a means of continued public input, one possibility would be what Toffler calls "social future assemblies," which might be characterized as a workable-sized assembly, democratically chosen, for the purpose of answering the question "What kind of a world (state, city, neighborhood) do you want ten, twenty, or thirty years from now?" (57) A sampling technique could be used to select panels of citizens, with new panels selected at regular intervals. Participation could be as legally recognized as jury duty.

To supplement the process, Montana's public television station, which is now in development, could be used to disseminate information, and a free telephone could be available to the public for their response. Scientific measurement techniques, including polls, and referendums could also be used in the goal revision process.

With regard to the monitoring process, indices could be created, and continually revised, to measure the state's success in achieving goals. For example, let us assume that "Growth on Our Terms" is the chosen alternative future, that energy conservation is a policy, and that a specific sub-goal of a 10% reduction in energy consumption has been articulated. If, after a suitable period of time, the Goals Commission finds that this objective is being met, a favorable report is presented. If, on the other hand, consumption has been reduced to a lesser degree or has actually increased, further analyses must be completed by the Commission.

The Commission may determine that a 10% reduction is unattainable or not a true expression of the desires of the people. In this instance, a recommendation would be made that the sub-goal itself be revised, perhaps to a figure of 5%.

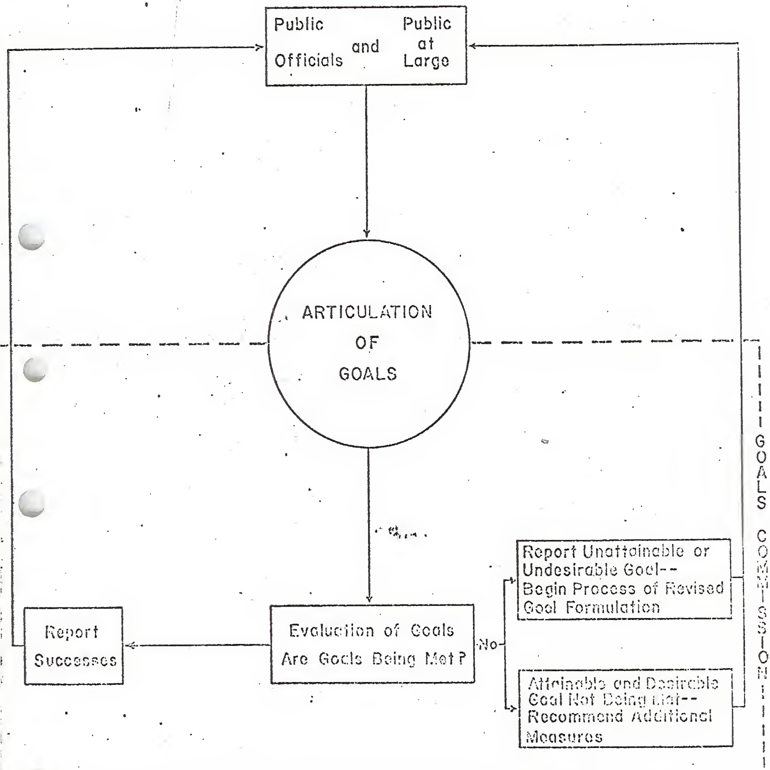
However, if the Commission finds that the original sub-goal is both realistic and desirable, stronger conservation measures will obviously be needed. The Commission will then have the responsibility of recommending specific action and/or legislation to the Governor and the people. In this instance, increased energy prices might be one such recommendation.

The goal articulation and revision process is diagramed in Figure I.

The entire mechanism, as described, is thus far an academic exercise. It is clear, though, that Montana must soon devise a means to shape our own future, or it will be shaped by uncontrolled growth.

Figure I

GOALS PROCESS


Public Officials
and
Public at Large
ARTICULATION OF GOALS
Evaluation of Goals
Are Goals Being Met?
Report Successes
No
Report Unattainable or Undesirable Goal-- Begin Process of Revised Goal Formulation
Attainable and Desirable Goal Not Being Met-- Recommend Additional Measures
GOALS COMMISSION

IX. A WORLDWIDE MALADY

The pressures being exerted on Montana - increased population, industrialication, resource depletion, environmental degradation, social and political disruptions- stem, finally, from exponential growth rates. Montana is a microcosm in that such growth is occurring and creating similar problems throughout our planet.

A. Examples of Exponential Growth

1. Population Growth

A most fundamental fact and concern of our times is world population growth.

> The gravest problem facing man in a peaceful world is the establishment of a reasonable harmony between a stabilized world population and the environmental resources upon which that population depends. (69)

Doubling time is a vivid indication of world growth rates. The time required for population to double is decreasing at an alarming rate, as shown in Table 8.

TABLE 8

POPULATION DOUBLING TIMES (11)

Date	Estimated World Population	Time For Population to Double
8000 B.C.	5 million	
		1,500 years
1650 A.D.	500 million	
		200 years
1850 A.D.	1,000 million (1 billion)	
		80 years
1930 A.D.	2,000 million (2 billion)	
		45 years
1975 A.D.	4,000 million (4 billion)	

Computed Doubling Time Around 1970 is 35-37 years.

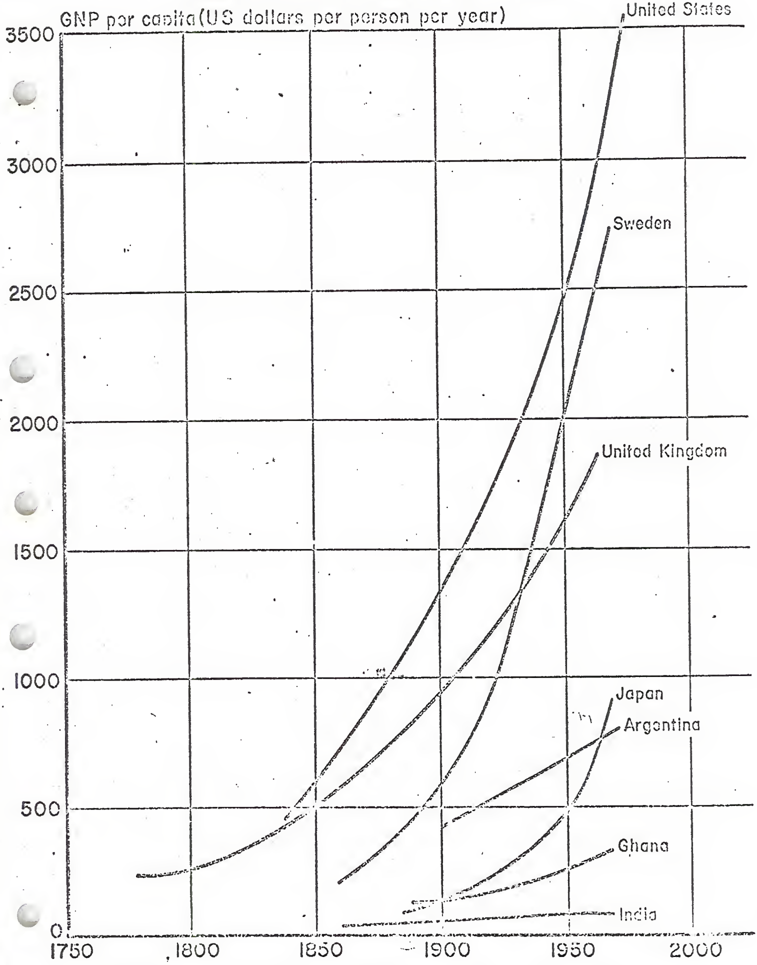
World population estimates for the year 2000 range from an optimistic low of 4.5 billion to a high of 7 billion. (37)

2. Economic Growth

Industrial output has been increasing throughout the world at a rate of 7% per year, compared to an annual population growth of 2%, but most of the world's economic growth is occurring in the already industrialized countries with a relatively low rate of population growth. (30) The economic growth of individual nations indicates that differences in exponential growth rates are widening the economic disparity between the "have" and the "have-not" countries. (Figure J)

In the face of the expanding gap between nations, it will become increasingly difficult to persuade the developing countries to seek growth-control policies. And yet, it is becoming apparent that material wealth can no longer be equated with the welfare of a nation or an individual. In addition, the higher a country's industrial production, the more it contributes to polluting the world environment and depleting finite resources. (71)

ECONOMIC GROWTH RATES



SOURCE: Simon Kuznets, Economic Growth of Nations (Cambridge, Mass.: Harvard University Press, 1971).

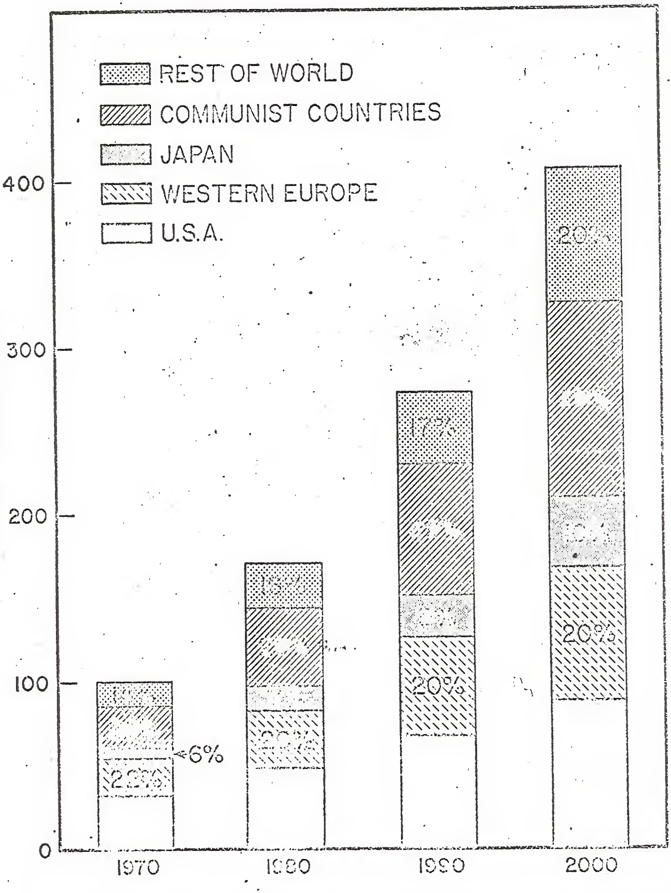
3. Energy Growth

International energy consumption has been and will continue to accelerate. (Figure K) American energy use has fallen from 50% of the world's total to about 33% during the past 50 years. This partially results from amazing energy growth in Japan, with an annual postwar growth rate of between 10 and 15%. (50)

The approximate world growth rate in energy demand is 5% annually, which would multiply total demand by more than four times by the year 2000. (23)

A corresponding increase in energy supply is untenable. If one large nuclear power plant were built in the world daily until 2000, we would still have to rely on fossil fuels for more than half our energy, we would burn these fuels at twice the present rate. (55)

WORLD ENERGY CONSUMPTION



SOURCE: Shell Oil, The National Energy Outlook, March 1973

B. Examples of Shortages

Exponential growth will inevitably result in shortages, for supplies of sustaining raw materials are finite. Shortages are already becoming ominous in many natural and processed materials.

1. Minerals

In 1972, United States' imports, from more than 40 countries, included 100% of our mica, 93% of our manganese, 92% of our cobalt and graphite, 91% of our chromium, 81% of our aluminum, and over 50% of our platinum, tin, nickel, antimony, bismuth, mercury and zinc. (48) We import one-third of our iron ore, and by 1985, imports are expected to increase to 50%, as they will for lead and tungston. (12)

A recent paper of the U.S. Geological Survey noted that:

> ...in attaining our high level of living in the United States, we have used more minerals and mineral fuels during the last 30 years than all the people of the world used previously. The enormous consumption will have to be doubled just to meet the needs of the people now living the United States through the remainder of their lifetimes, to say nothing about the needs of succeeding generations, or the increased consumption that will have to take place in the lesser developed countries if they are to attain a similar level of living. (29)

As competition for such materials intensifies, prices will rise. John Love, former U.S. energy policy director, stated, "We have already learned that there are no cheap foreign sources of oil and gas, and we may soon learn that there are no cheap foreign sources of other minerals." (24)

Shortages will cause more than economic problems. "Worldwide competition for finished goods and raw materials...is straining the political alliance of solid postwar partners like the U.S. and Great Britain, France and Japan. It is a condition almost certain to get worse as scarcities of all kinds persist..." (13)

> And coming to the forefront is the most serious question of all-namely, whether or not resources are adequate to support the continued existence of the world's population and indeed

> our own. The possibility to consider here goes much beyond Malthus' gloomy observations concerning the propensity of a population to grow to the limit of its food supply, for both population and level of living have grown as the result of the consumption of nonrenewable resources, and both are already far too high to maintain without industrialized, high-energy, and high mineral-consuming agriculture, transportation, and manufacturing. (29)

In a study conducted by Resources for the Future, it was found that worldwide reserves of aluminum, lead, zinc, tungston and sulfur are inadequate to meet "high" projections of cumulative demand by the year 2000, and that by 2020 copper, manganese, nickel, molybdenum, and titanium would be added to the list (46). Computations by the Club of Rome differ slightly, as shown in the following partial table, but the implications are the same. Even coal, seemingly abundant, will be exhausted in a suprisingly short period. Finite supplies cannot indefinitely support infinite growth, and we are rapidly reaching the physical ceilings.

TABLE 9.

Nonrenewable Natural Resources

Resource	1	2	3	4
Aluminum	1.17x10^{9} tons	100	31	55
Coal	5x10^{12} tons	2300	111	150
Copper	308x10^{6} tons	36	21	48
Lead	91x10^{6} tons	26	21	64
Manganese	8x10^{8} tons	97	46	94
Molybdenum	10x10^{9} tons	79	34	65
Nickel	147x10^{9} lbs.	150	53	96
Tungsten	2.9x10^{9} lbs.	40	28	72
Zinc	123x10^{6} tons	23	18	50

1. Known global reserves.
2. The number of years known global reserves will last at current consumption rates.
3. The number of years known global reserves will last with consumption growing exponentially at the average annual rate of growth.
4. The number of years that five times known global reserves will last with consumption growing exponentially at the average annual rate of growth.

2. Food

Food shortages are more critical than shortages of minerals, for the latter is primarily a question of production; the former, of survival. Perhaps one-third of the world's population lives in a state of chronic malnutrition (30), famines have been experienced in India and in sub-Saharan Africa, and grim predictions have been made of the imminent economic collapse and starvation of some 40 nations because of shortages in and expense of fuel, food and fertilizer. (43)

The amounts of food needed to sustain the world's population are staggering. A graphic illustration has been provided by Dr. Norman E. Borlaug, Nobel Laureate:

> Imagine a highway of grain, 55 feet wide and 6 feet deep, girdling the earth at the equator. Now imagine adding to it every year a 625- mile link in a second lane of the same width and depth. The highway is the amount of grain needed to feed the world now; more such links will be required to feed the 78 millions added annually to the world's population. (4)

Such dramatic expansions of food production are unlikely. In the United States, although marginal land is being put back into cultivation, vast amounts of the most productive land are being converted to highways, shopping centers, airports, etc. On a worldwide scale, although only about half of the potentially suitable 32 billion hectares are in production, those are the most fertile and the most accessible. (30) Water will be a limiting factor in many instances, and irrigation and fertilizer costs will be increasingly prohibitive.

And the relationships to energy become extremely complex. The most modern techniques would be required to substantially increase the amount of food, but the machinery, transport, irrigation, hybrid crop development and manufacture of fertilizer and pesticides would consume more energy than they would produce in the form of food. (53) To keep abreast of a world population expected to double in about 30 years, nitrogen fertilizer production would have to be increased by a factor of 100. Plants on that scale would use the equivalent of one-fifth of today's world energy supply (23), but competition for energy will be intense.

X. RECOMMENDATIONS

The social, economic and environmental disruptions in Montana have been occasioned by demands for our resources, which in turn have as their impetus exponential growth rates in virtually every material variable. Such rates are universal, as illustrated by the international examples of population and economic growth, and such rates are resulting in shortages of food and essential raw materials.

Ever increasing amounts of energy will be needed to produce food, extract and process raw materials, etc., so that such shortages might be alleviated. However, energy, too, is in short supply.

A. Energy

(1) Because of the limited supply of the world's remaining fossil fuel resources, use of these energy sources should be de-emphasized.

(2) Technology, capital and research directed toward developing sustained energy sources, like solar, tidal and winds, should be greatly increased.

(3) Caution should be exercised in making excessive and long-term commitments to any specific fuel or technology. Flexibility should be designed into energy systems so that the transition from one source or technology to another can be made quickly with a minimum of impact and dislocation.

(4) All countries, but especially the more industrialized nations, should take strong steps to reduce energy requirements.

(5) Global environmental quality must be preserved and improved to protect life support systems that transcend international boundaries and to prevent a decline in living conditions. The acquisition of additional energy should not be allowed to lead to excessive environmental degradation and ecosystem breakdown.

B. Growth

Actions to confront the worldwide energy situation are essential, but this problem cannot be isolated. Adequate energy would, for example, allow us to

continue and increase the harvest of crops, but it cannot increase the amount of arable land.

Similarly, technology cannot increase the amount of raw materials in the earth's crust; it can only make them more accessible or permit substitutions of material in products until those substitutes, too, are used up. Consequently, technological advances may at best only postpone the exhaustion of supplies and, at worst, may hasten it.

Consequently, we must not beg the real, underlying issue. The problem of growth must be addressed.

1. If growth is not limited, voluntarily or mandatorily, ceilings imposed by population, pollution, capital or resource base will be reached, resulting in the collapse of all systems.

2. Governments should act to ensure that catastrophic limits are not reached unwittingly. Education of the populace will be essential, but insufficient in itself. Growth should be directed and controlled through a system, possibly similar to that being explored in Montana, or to the plan advanced by the Keizai Konwakai, a private group of Japanese businessmen, which advocated the reduction or elimination of expansion of certain industries. (3)

3. The so-called "underdeveloped" nations should not, in their legitimate efforts to improve the standard of living, attempt to follow precisely the example of industrial, energy-intensive nations. In "primitive" (manual labor) cultures, for example, each calory of energy invested produces up to 50 calories of food. In industrialized systems, 5 to 10 calories of energy are expended to produce 1 in food. If all countries followed such energy-intensive patterns, the world would use 80% of its energy just to produce food. (23,53)

4. Reductions in exponential growth rates will mean a changed, but not necessarily a worsened, life style--particularly in industrialized nations. In a state of global equilibrium, mankind can not only survive but can actually continue to develop in less material but more profound ways. Those most gratifying pursuits of man--education, art, music, religion, basic scientific research, athletics, social interaction--these are not highly dependent on resource consumption. Indeed, if man were emancipated from the material growth rat race, he would be freer to pursue such higher goals. A stationary world is not equivalent to a stagnant world, and it is apparently the only option which is still available to our planet.

5. Unilateral actions to control growth would doubtlessly be ineffective over the long term. One national group, for instance, could conceivably exhaust the world supply of a certain material or cause pollution harmful to the entire globe. Cooperation between all nations will be essential. "We had better start facing up to the almost overwhelming realities of these long-range problems--of energy, of food and resource supply, of human numbers, and of uncontrolled growth. And we must recognize that ultimate solutions are only going to be found--if at all--within a global context." (61)

XI. SUMMARY

This paper has described Montana's qualities, problems, and aspirations. Our people rightfully believe the state has offered an unexcelled and unduplicated way of life, for we had thus far escaped the frenzied, machine-dominated society associated with rapid industrialization.

Now, however, external demands for energy, and for other of our natural resources, are creating serious social, economic and environmental disruptions. We are thus beginning to mirror the problems of the nation and of the industrialized world.

Yet, we hope to be more than a microcosm in the sense of symbolizing the world's challenges. We are striving to become, instead, a symbol of solutions, for we are attempting to shape our future through the deliberate statement of goals and the explicit control of growth.

Montana can become a worthy example if the change we encounter and adjustment we make transform us into a society where man is in harmony with natural limits, where conservation and restraint are practiced, where well being is measured in terms other than money and material affluence, and where we judge our civilization, not in terms of what we consume, but in the quality and permanence of that which we leave behind.

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